Integrated Pest Management in the Northeast Region

1996 Update:

Involving Stakeholders

Cooperative State Research,
Education, and Extension Service (USDA)
and Cooperating Land Grant Universities

...AST REGION

From Maine's rocky coast to the ... West Virginia lies the Northeast Region of the United States. These 12 states are home to 142,000 farm owners.

Each Northeast farm is unique in size, location, crops, and management, but the farmers share something with one another: they have all benefitted by the extension of information about integrated pest management (IPM). In this report, we look at some of the ways that USDA Smith-Lever 3(d) funds and special grants have touched the lives of producers, and how those producers are now helping to improve the entire region.

As in the past, growers continue to call pest-hotline numbers, consult Extension agents or IPM-trained consultants, receive IPM newsletters, and participate in on-farm demonstrations comparing conventional practices with IPM practices. For decades these interactions defined Cooperative Extension. University personnel "extended" knowledge to the client.

In recent years, however, this model has been changing. Extension programs are now seen more as two-way streets, with knowledge flowing from the producers back to research scientists and Extension educators.

A major impetus for this change has been the USDA IPM Initiative, begun in 1994 in response to the Administration's goal of implementing IPM practices on 75 percent of the nation's crop acres by the year 2000. The reason for such a goal is that increased use of IPM enables farmers to realize economic benefits and reduce the risks to human health and the environment that are associated with pesticide use.

...ative Involving Stakeholders

At the core of the USDA IPM Initiative is the concept of stakeholder participation. When producers help to develop IPM programs, for example, they implement IPM practices more readily on their farms. When environmentalists learn about the challenges inherent in pest management, they understand the dilemmas facing producers.

For these reasons, the USDA IPM Initiative began funding multistate proposals that would allow stakeholders to work together to establish research and extension priorities for IPM. Competitive grants were awarded in 1995 to eight teams involving northeastern states. Most northeastern states are participating in more than one grant, as shown in the sidebar on the opposite page.

Team members consist of growers, Extension agents, private consultants, scientists, and environmentalists. To date, 307 stakeholders have voluntarily participated in this team-building process, known as Phase I. Subsequent phases of the Initiative, which would include privatization of IPM services, are pending Congressional support.

The Northeast as a Region

Northeastern states, as shown in the chart below, have high national rankings in the production of two dozen crops. These products are shipped within the region to help feed 59 million residents, and sent to national and international markets.

In 1996 the USDA funded a regional facilitator for IPM, Jim VanKirk, who promotes communication among states and acts a liaison between the region and the USDA. He has facilitated meetings, set up a Northeast electronic mail server, and designed a Northeast IPM site on the World Wide Web that is updated regularly.

As this report shows, IPM in the Northeast Region continues to develop through the sharing of public and private resources. Hundreds of collaborations occur daily among IPM Extension educators, researchers at universities, farmers, and personnel at agencies and private institutions.

A prime example of such collaboration is the newly formed Northeast Weather Association (NEWA). NEWA members receive regionalized weather forecasts and pest management information to help them maximize production while minimizing negative impacts on the environment. The network was established with the assistance of a USDA grant in 1995 and augmented with private purchases of equipment.

Members of NEWA, who consist of fruit and vegetable producers, Extension personnel, private consultants, and industry representatives, share the data from 54 weather instruments in New York and Pennsylvania. The jointly owned system runs pest models that help growers predict the occurrence of diseases on grapes, apples, potatoes, and onions.

How Northeastern States Ranked Nationally for Production in 1995

☆1st Place	☆2nd Place	☆3rd Place	☆4th Place
DE—*Lima beans (processing)*	MA—*Cranberries*	NJ—*Asparagus (fresh market), Cranberries, Escarole*	DE—*Cucumbers (pickling)*
NY—*Apples (canned)*	NJ—*Blueberries, Eggplant*	NY—*Apples (total), Grapes, Milk, Wine*	NJ—*Bell peppers, Spinach*
PA—*Mushrooms*	NY—*Cherries (tart), Corn silage, Grape juice, Snap beans (processed)*	PA—*Cherries (tart), Eggs, Grape juice*	NY—*Cauliflower, Cheese, Pears, Sweet corn*
	PA—*Apples (canned)*		PA—*Corn silage, Milk, Peaches*

USDA IPM Initiative Teams

A Process to Identify Opportunities for and Barriers to Implementation of Biologically Based IPM Systems for Diversified Farms in the Northeastern USA
Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

Development and Implementation of an Expanded IPM Program for Grapes in the Great Lake States
Michigan, New York, Ohio, Pennnsylvania

Greenhouse IPM in Northern New England—Economic Analysis and Planning for Implementation
Maine, New Hampshire, Vermont

Implementing IPM for Nurseries and Landscapes in the Northeastern and North Central Regions of the United States
Connecticut, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, Rhode Island

Improving Forage Legume Persistence Through Ecologically Based IPM
Georgia, Illinois, Kentucky, Maryland, Minnesota, Missouri, Nebraska, New York, Oklahoma, Pennsylvania, Vermont, Wisconsin

Integrated Crop Management for Small Grains in the Mid-Atlantic Region
Delaware, Maryland

IPM for Diversified Fresh-Market Vegetable Producers
New Jersey, New York, Pennsylvania

Research, Extension, and Implementation of IPM in Major Apple Production Regions of New York
New York

Myrtle Hetherington

Pennsylvania IPM Grower

"Let me show you my rock mulch," smiles Myrtle Hetherington. She picks up a handful of red clay shards—not quite the rich organic loam that one might expect. "This shale holds the moisture. The tomato plants love it." She flips over a rock and sure enough, it is wet underneath.

How that soil can support 125 acres of vegetables and more than 200 acres of oats, hay, and grain is a wonder, but for Myrtle and her brothers, farming this land is a way of life. "I worked every year of my life on this farm with my dad," explains Myrtle. Stretched around her are the contoured fields of Hetherington Mountain View Farm in Zion Grove, Pennsylvania. It is the same panorama that greeted her parents each day, but many things have changed.

Sprouting an IPM Program

From the smallest detail of choosing seed to the big picture of crop rotation, Myrtle incorporates the themes of integrated pest management. She plants as many resistant varieties as she can find, and is fussy about seedlings. "When we buy cabbage plants," says Myrtle, "I insist that the seed is hot water-treated against black rot and black leg diseases." Last year she controlled bacterial speck of green peppers completely through resistant seed.

"As I can remember, and it's not too many years ago," admits Myrtle, "we sprayed to *prevent* diseases. It was an automatic thing—every seven to ten days. But we don't do that anymore. "

Stalking the Beetles

Myrtle and her brother are constantly "watching for bugs," as she says. If they

find Colorado potato beetles, they return to the field every day until the beetles hatch; then they apply an environmentally friendly product. Last year they sprayed only once for the beetles. Overall, they are spraying about half the number of times they sprayed five years ago, and their pesticide bills have decreased an average of 9 percent annually since 1993.

Disease-resistant seed and scouting are important on this farm, but in truth, rotation is the backbone. The sites for growing vegetables are changed each year so that no vegetable is grown more than once every four years in a given spot. In the intervening years, oats, then timothy and alfalfa take their turns on the site. Beyond rotation is careful site selection. For example, to prevent outbreaks of the striped cucumber beetle, Myrtle never plants cucumbers too close to the previous year's site. These sustainable techniques eliminate many problematic pests.

Once the vegetables near maturity, Myrtle is busy making arrangements with brokers. Cabbage finds its way into Giant and Safeway stores. Cucumbers go to a packing house. And some of the tomatoes and sweet corn that flourished in the rock mulch at Hetherington Mountain View Farm are transported to New York City.

Learning and Living IPM

Myrtle has learned how to integrate pest management techniques through experience and by listening to Extension personnel, such as Shelby Fleischer. "The meetings that are really informative are the all-day Extension ones," she says. "It used to be that all winter long you could relax. Now we go to *zillions* of meetings." Being a director of the Pennsylvania Vegetable Growers Association means that Myrtle is involved in education, research, marketing, and long-term vision.

Myrtle was recently invited to participate in team building with producers from Pennsylvania, New York, and New Jersey for the National IPM Initiative. She is excited about the federal government taking the initiative to gather farmers' ideas and concerns. "They need to get the word out to people about IPM," says Myrtle. "If smaller farmers are not informed, they'll become afraid of the idea. The truth is, a lot of farmers have a pretty good start on IPM."

MASSACHUSETTS

"Good Guy" Parasites Winning Against Whiteflies

Four growers in Massachusetts are growing poinsettias without relying on chemicals to control whitefly pests. Instead, they are releasing beneficial wasps that are smaller than fleas.

The beneficial species is *Eretmocerus californicus,* a natural enemy of the silverleaf whitefly. *Eretmocerus* can behave like a predator; it punctures the immature whiteflies (nymphs) and feeds from the wound. Sometimes *Eretmocerus* parasitizes a nymph by laying an egg underneath it. Upon hatching, the wasp larva chews its way into the nymph and feeds.

The beneficial *Eretmocerus* sp., enlarged. Photo: M. Hoddle.

Biological control of whiteflies is not a new concept, but scientists in Massachusetts and New York are joining forces in this program to evaluate which species, release rates, and timings are the most effective. Greenhouse trials in 1995 with *Eretmocerus* gave acceptable control on a commercial poinsettia crop when supplemented with two applications of an insecticide near the completion of the crop.

Throughout 1996 the researchers will be looking at integrating wasp releases with insect growth regulators—chemicals that retard the development of insect pests. They hope this integrated approach will increase the cost effectiveness of the wasps and stall or prevent the whitefly's development of resistance to growth regulators.

University of Massachusetts Extension personnel have produced a four-page fact sheet with color inserts called *A Grower's Guide to Using Biological Control for Silverleaf Whitefly on Poinsettias in the Northeast United States,* which is currently available.

Silverleaf whitefly, enlarged. Photo: J. Sanderson.

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NEW JERSEY

Consultants Form Kernel of IPM Program

New Jersey producers are about to get a taste of IPM offered by private consultants instead of through Cooperative Extension. This year 74 sweet-corn growers have the opportunity to participate in private-sector IPM programs.

Brubaker Agronomic Consulting Service will contract with sweet-corn growers in all central and southern counties south of Mercer and Monmouth. McConnell Agronomies will be available in the southernmost counties of the state. Producers will continue to pay a scouting fee, and the expectation is that they will continue to reduce pesticide sprays by 25 percent.

Easing into the private sector has been a long-term goal of New Jersey's sweet corn program, which began in 1972 with 12 participants. Until this year, two program associates and 10 seasonal scouts have been responsible for reading blacklight traps and using economic thresholds for such pests as corn earworm, European corn borer, fall armyworm, sap beetles, corn smut, and corn rust.

One reason for the transition is that the new consultants share an IPM philosophy. Don Prostak, coordinator of the New Jersey IPM Program, says, "This shift will allow our Extension people time to do research on thresholds and develop IPM for other crops. Our goal is that some day, standard agricultural practices and IPM will be one and the same."

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Pennsylvania

Mushroom Industry Spawns IPM

Pennsylvania, the number one state for mushroom production in the United States, is also a national leader for mushroom IPM. More than 250 farms produce the common button mushroom *(Agaricus bisporus),* and most of these farms have been influenced by 70 years of IPM research and Extension activities at Pennsylvania State University.

Manager Phil Coles checks a crop of mushrooms at Giorgi Mushroom Co., the largest single mushroom farm in the nation.

Mushroom production has its own lingo, from the "ricks" or rows of compost that will serve as food for the mushrooms, to the "spawn"—the pieces of grain coated with mycelia that will eventually fruit into the mushrooms we buy in the store. Mushroom production also has its pests, such as "weed" molds, Sciarid flies, and verticillium disease. In the past, Pennsylvania mushroom managers depended on chemical pesticides to manage pests, but now they employ specific insect growth regulators. They also rely on physical, cultural, and biological controls in the process of growing 47 percent of the nation's mushrooms.

Phil Coles, the project manager at Giorgi Mushroom Company, has a motto: Cleanliness is the name of the game. Compost is meticulously blended to provide the nutrients required by the particular mycelium that produces the crop. When compost is placed in the mushroom house it is steam pasteurized, then pasteurized again after production.

To curtail other pest problems, many mushroom producers now grow the crop in 10 weeks, rather than 14 weeks. They monitor blacklight traps (shown below) that attract insects. They seal cracks and filter intake air to exclude organisms, and they release beneficial insects.

Producers are seeing results with IPM. Pest problems are down, and savings are up. For example, the pesticide bill at Giorgi Mushroom Company has been steadily dropping despite the fact that the company has grown and pesticide prices have risen. Says Phil, "Pesticide use has decreased dramatically. On a pound basis, it's down 90 percent."

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Delaware

Farmers Benefit from Integrated Program

Potato and field-crop farmers in Delaware are fortunate to have IPM programs that give the word "integrated" new meaning.

State IPM Coordinator Joanne Whalen and other Extension personnel have involved private and public institutions in a potato IPM program that benefits 17 growers and their 6,000 acres of potatoes. To combat the Colorado potato beetle, Extension personnel have established a demonstration using a biological control agent, called the predatory stink bug, instead of insecticides.

To teach producers about late blight in 1995, Extension specialists held meetings, sent out newsletters and individual mailings, made phone calls, and recorded pest information on a hotline. They monitored six weather stations and used the data to predict whether late blight would develop and when. With the help of Delaware's Department of Agriculture, they tested questionable seedlots for the presence of late blight fungus. Through these integrated methods, they helped potato growers save $475,000 last year.

Field-crop farmers in Delaware and other states benefitted in 1995 from a different kind of integrated pest management. Cooperative Extension personnel from Maryland and Delaware pooled their resources to offer intensive training for certified crop advisors. It was the first school of its kind for field crops, and 200 people from seven neighboring states attended. This three-day training in Maryland, sponsored by the University of Delaware, the University of Maryland, and Maryland's Department of the Environment, provided certified crop advisors with required continuing education units. Amidst hands-on learning opportunities, 50 experts spoke on the management of pests, soil, water, and nutrients. The second Mid-Atlantic Crop Management School will be held this November in Delaware.

The sensor unit used in Delaware's Potato IPM Programs helps to predict when the crop is at risk of late blight. Photo: J. Whalen.

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Jeff Green

New York IPM Grower

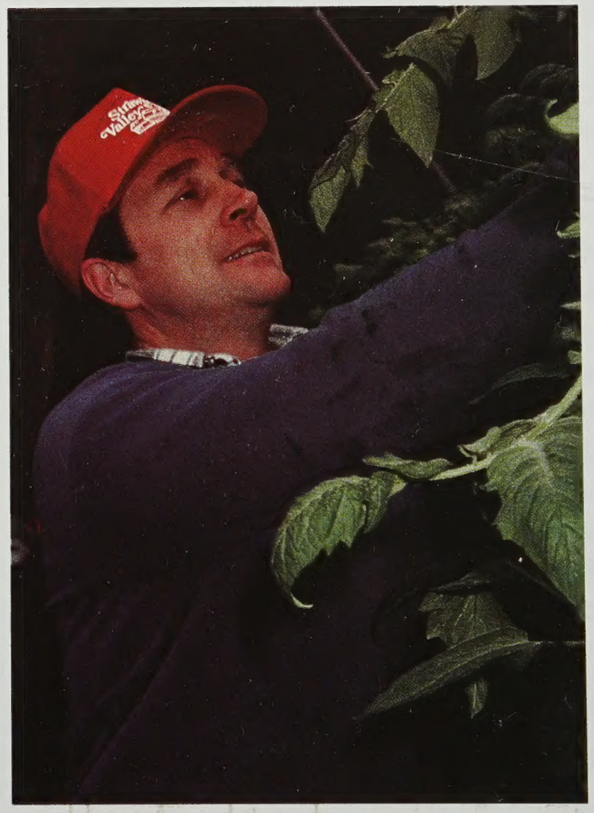
Near the Whitney Point exit of Interstate 81, you can see Strawberry Valley Farm. It looks like a rejuvenated dairy farm, which is exactly what it is. In the early morning hours, clerks are starting the registers in the adjacent farm store, and a worker starts out to weed the asparagus fields. "I'll show you the rest of this place," says owner Jeff Green, "but first you have to see *this.*" He leads the way to a greenhouse with a 1,000-gallon plastic tank in the middle of it. PVC pipe and gravel decorate the soil-less floor. "My hydroponic tomatoes," he announces. Lush plants harboring green tomatoes reach to the sky, protected from the chilly May temperatures. In a few days, Jeff will sanitize the watery solution that is the lifeblood for this crop. "It prevents diseases," he says. "I learned the hard way."

To keep insects at bay, Jeff releases parasitic wasps—which are smaller than fleas and harmless to humans. He also uses beneficial mites to manage spider mites. "Biocontrol is definitely working," he says. "I've seen a big difference in the occurrence of whiteflies. And the public is impressed!"

They're also impressed with the field tomatoes, sweet corn, peppers, beets, peas, cabbage, cauliflower, broccoli, cucumbers, summer squash, and other crops coming out of this pick-your-own farm. "We needed to create a reason for people to come here," says Jeff Green. And he seems to have created more than one reason.

Value-Added Farm

Jeff Green and his partners, Peggy and Larry Frederick, give new meaning to the words *value added.* They convert the bounty of the land into fresh produce, canned products, maple syrup, and baked goods. They have made Strawberry Valley a place for people to come for an experience, an escape from everyday routine, a taste of rural life. *And* they have added value by growing the produce with IPM.



"We advertise that we're an IPM farm and all of the people who come here to buy vegetables can talk with us," says Jeff. He got on the IPM track when he agreed to set out traps as part of a project with the New York State IPM Program. The goal? To determine the first presence of corn pests. "The results scared us," says Jeff, "because at that point we were spraying once a week or every 10 days to take care of bugs that weren't there!" To hold off on spraying was a new concept. Since then he's learned to identify pests and try new thresholds, waiting until pests reach a certain population before spraying.

What has been the effect on pesticide inputs? "Well," explains Jeff, "Grandpa Green sprayed every five days, whether he needed to or not. There was this white cloud.... Today, there are certain things I have to spray once a week for and others where the chemical bill has been cut in two." Jeff also tries to plant varieties that will resist pests, such as cabbage that isn't sensitive to thrips. And he reads as much as he can get his hands on.

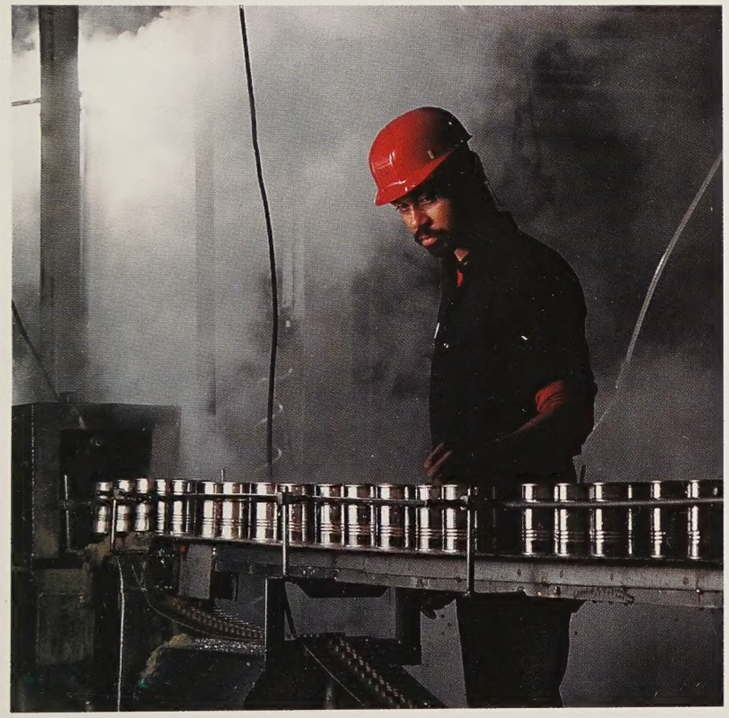
Jeff's interest in IPM led him to attend the recent National IPM Symposium in Washington, D. C., and has spurred him to participate in the regional planning team for the IPM Initiative. "Five years ago," says Jeff, "I would have said that growers' opinions were lost. Now Cornell Cooperative Extension is really trying to service the grower."

New York

Pass the IPM Peas, Please

This summer shoppers at Wegmans Food Markets, wheeling down aisles of canned vegetables, will see New York's IPM logo on new cans. The contents? Peas grown by producers using IPM techniques, as specified by Wegmans, agricultural producers, and the processor, Comstock Michigan Fruit.

By this fall, cans of Wegmans table beets, snap beans, sweet corn, sauerkraut, and carrots will sport an IPM logo. The store's fresh-market sweet corn will also be "IPM-grown." This collaborative project, initiated by Wegmans in 1994 and encouraged by the New York State IPM Program and Cornell Cooperative Extension, benefits all of the parties involved. For Wegmans, with its 47 stores in New York and three in Pennsylvania, the program is in keeping with its number one national ranking for attention to consumer education and quality of stores. According to Bill Pool, Manager of Food Safety and Regulation at Wegmans, "IPM is not only a means of reducing the amount of chemical inputs necessary to produce high-quality agricultural products, but also a great opportunity to change the public perception of the agricultural system. As we know from surveying our customers, when the public understands what IPM is, and what it represents in terms of reduced chemical inputs, consumer support is overwhelming."



IPM-grown foods are processed and marketed to New York consumers. Photo: R. Barker.

Extension specialists helped to develop the curriculum that was used to train growers in IPM methods, and they assist regularly with diagnosing pest problems, developing guidelines, and implementing the program. IPM Extension Specialist Abby Seaman says, "The unique aspect of this project is that the *industry* is asking for it and the *market* is asking for it." The major food processors of sweet corn in the state have been packaging IPM-grown corn for several years, saving the industry up to $500,000 annually in spray reductions.

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Rhode Island

Can Northeastern Lilies Be Saved by a Mystery Wasp?

The coordinator of the IPM Program at the University of Rhode Island has become a detective solving the mystery of the lily leaf beetle, a pest that is devastating lilies within a 30-mile radius of Boston, Massachusetts.

To find a natural enemy of this scarlet and black pest (below), Dick Casagrande and graduate student Sayles Livingston recently travelled to France. There the beetle exists but does not reach damaging populations. They found parasitized larvae of the lily leaf beetle, collected them, and brought them back to Rhode Island. In a quarantine laboratory, each larva has produced not lily beetles, but up to two dozen *parasite larvae.* Eventually these larvae will develop into beneficial adults—perhaps wasps—that probably do not exist in the United States.

As these beneficials are developing, another scientist is in China, where the lily leaf beetle is believed to have originated. She is studying the distribution and natural enemies of the beetle.

This type of problem solving is known as classical biological control. If successful, beneficial insects will replace the insecticides that are currently protecting lily-of-the-valley, Solomon's seal, Asiatic and Oriental lilies, and other plants being attacked. Until then, gardeners and landscapers in the area are being advised to apply neem products and other least-toxic materials, and to avoid transplanting lilies away from the Boston area.

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Maryland

Scientists Find Beetle Research Irresistible

The Colorado potato beetle, an adaptable pest that ravages potatoes, tomatoes, and eggplants, has developed resistance to many of the methods that are used to control it. To prevent this resistance and to learn more about how beetles develop it, researchers in Maryland have launched several projects with growers and other collaborators.

One project focuses on populations of Colorado potato beetle that are susceptible to the New Leaf transgenic potato. This commercially available potato has been genetically altered to contain a gene from the bacterium *Bacillus thuringiensis,* known as Bt. The gene produces a protein in the potato, making it resist the beetle. Never before have baselines been established on susceptible populations before a new pest management method is introduced.

Collaborators in two Canadian provinces and 13 states (many from the Northeast) collected 79 susceptible populations of potato beetles from commercial farms. These populations showed significant variation in susceptibility and have already been compared to resistant, laboratory-reared beetles. As growers in the collection regions employ the New Leaf potatoes, scientists and growers will look at whether the beetle populations change. Early detection of changes will spur the use of alternate tactics to prevent resistance.

Related studies, begun in 1995, involve limiting the application of a new insecticide to preserve its usefulness over time. On a dozen potato farms, a 100-foot wide strip around the perimeter of the field was treated with the insecticide imidacloprid. This toxic barrier prevented migrating beetles from walking into new potato fields. Use of imidacloprid was cut by 50 to 95 percent of conventional applications, and beetles were controlled for at least 90 days after treatment. Control costs were 75 percent less than the cost of treatments for whole fields. Results from these ongoing studies have already begun to benefit farmers throughout the region.

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Maine

Potato Program Has Eyes for IPM

Maine potato growers have a lot on their minds. They need to manage their business, keep a watchful eye on pests, and protect a crop that's worth $130 million annually. It could be hard to sleep at night, if it weren't for the University of Maine Cooperative Extension Potato IPM Program.

Maine's potato IPM program relies on people, publications, and technology to reduce pesticide use while maximizing crop yields. At its core is a multidisciplinary team of specialists and seasonal employees who work with 200 cooperators in the major production areas of the state. These producers benefit from computer-assisted pesticide recommendations derived from data collected by 150 small weather stations. A computer modeling program uses the data to predict the development of disease, allowing growers to adjust their fungicide spray schedules to disease pressure. In 1991, potato growers reduced the fungicide load statewide by 48 tons. In 1994, disease forecasting combined with a red postcard "warning system" to growers prevented millions of dollars in losses from late blight.

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Projects Funded through the Competitive Northeast IPM Grants Program

Adapting cultural practices for management of arthropod and nematode onion pests (NY)

Developing traps and fruit volatile lures for monitoring the blueberry maggot fly (ME. NJ, NY, RI)

Integrated management of immigrant Phytophthora infestans: Area Wide Systems (CT, NY)

Integrated pest management of beetle pests of cucurbits (NY)

Development of a more comprehensive weed management approach for Lima Bean Production (DE, MD)

Integrated crop rotation and plant resistance in onion pest management (NY)

Northeast Regional IPM Program Administration (MA)

Integration of insect growth regulators and biological control agents for control of whiteflies on poinsettia (MA, NY)

Selling the nursery industry on sustainable trees and shrubs (RI)

Deployment of use/risk reduction practices for imidacloprid in Colorado Potato Beetle management (MD)

Francis Botek

Pennsylvania IPM Grower

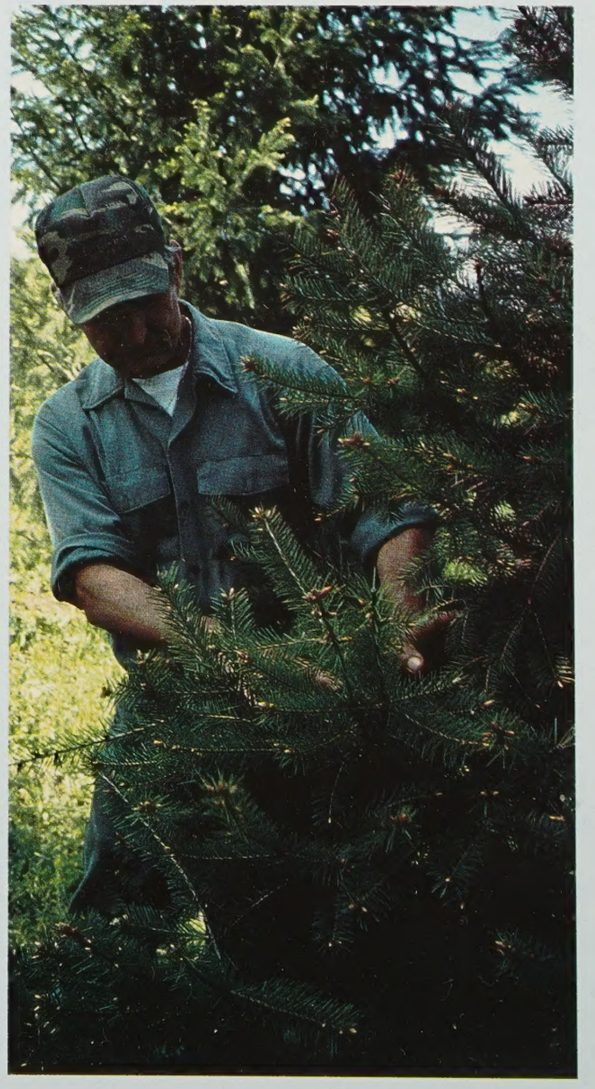
Francis Botek is striding from evergreen to evergreen at Crystal Spring Tree Farm, shaking his head in a half despairing and half playful way at the brown, drooping tips of the branches. "May 14th," he says, "it was 21 degrees and there was a quarter-inch casing of ice on these seedlings! In 31 years of growing trees, I've never seen frost damage like this." He predicts that in a few weeks this sloping hillside will look even more pathetic, and that some trees might never recover.

Christmas tree growers like Francis and his son Chris are at the mercy of nature, and yet they have a few tricks up their sleeves. Francis chooses varieties that are, *in most years,* suited to the climate of his Lehighton, Pennsylvania farm—firs such as Douglas, Frazier, Concolor, and Balsam. He grows white pine, Southwest white pine, red pine, and Colorado blue spruce. These are no backyard varieties. As a certified nurseryman, Francis offers live, balled trees, choose-'n-cut for local customers, and premium wholesaled trees for markets in New Jersey, Pennsylvania, and New York. Last Christmas, 40 of his Douglas fir trees decked Radio City Music Hall, and in previous years he has provided the Commonwealth's capital with holiday greenery.

It takes about ten years and a lot of know-how to grow trees to harvest. The low, green forests of Crystal Spring Tree Farm may look like paradise to an outsider, but a seasoned grower like Francis senses all the particulars. "You see this tree here?" Francis quizzes, pointing to a Douglas fir. "It's the perfect tree. You know why? It breaks bud really late, so the frost doesn't nip it." Sure enough, the tips are just emerging from their papery casings. "And," Francis continues, "it's resistant to Cooley spruce gall adelgid, a major pest."

Shuns "Firefighting" Method

To combat pests, many tree growers in Eastern Pennsylvania rely on helicopters to spray pesticides up to four times a year. Francis, however, is an advocate of IPM. His farm borders a school where children play outside on the fields, so he avoids cover sprays. "I don't take a firefighting method," he explains. Francis learned to scout for pests by attending several short courses at Penn State. When he finds a pest, he spot sprays. In 1995 he spot-sprayed one insecticide and applied a soap spray that was extremely effective. "Some growers will add insecticides to fungicides. But if I don't think a pesticide is needed, I don't spray it," he says.



Of course he gets support. Several times a season, Rayanne Lehman, an entomologist with the Pennsylvania Department of Agriculture, treks to Carbon County. She scouts for pests at his farm as part of the Christmas-tree IPM hotline that Pennsylvania has offered for three years. "These people are wonderful," says Francis. "They're always willing to help us." One day Francis marched Rayanne all the way up the hill to show her one tree—out of thousands—that he thought had spruce spider mites on it. When she asked him how he found it, he replied, "I could smell 'em."

Francis mixes humor, knowledge, and experience into each part of his business. He takes special pride in a "seed orchard" that he hopes someday will produce trees with superior characteristics: late bud break, good form, and insect and disease resistance. He plants exceptional trees here, then culls any that show problems. The trees are never sprayed with pesticides, and he babies them along. "I used to be a meat cutter," Francis admits, "but my heart was out here. You know what they say: if you enjoy what you're doing, you'll never work another day in your life."

West Virginia

Disease-Resistant Hybrids Save Corn Crop

In the early 1970s, two corn diseases began threatening field-corn production in the Ohio River basin: maize dwarf mosaic virus and maize chlorotic dwarf virus. Today, thanks to IPM, farmers are managing these diseases by planting disease-resistant or disease-tolerant varieties.

The West Virginia IPM Program, in collaboration with the West Virginia Department of Agriculture and Ohio State University, continually determines which corn varieties are unaffected by both diseases. Through grower meetings and on-farm demonstrations, the IPM Program promotes the resistant varieties. John Baniecki, coordinator of the West Virginia IPM Program, says, "The virus causes sterile ears. If farmers didn't have our program, there would be no corn production in the region." Henry Kay, a corn farmer from Southside, West Virginia, is a cooperator in this ongoing IPM project. He says "I think the virus trials are important, since corn varieties are always changing. We need to keep up with their qualities and characteristics." Dale Nibert, agricultural producer in Ashton, agrees. "I use this information to decide which varieties I'll plant," he says.

Diseased plants show mosaic pattern on leaves and shortened internodes. Photo: J. Baniecki.

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Vermont

Easing Transitions from Research Trial to Orchard

With federal crop insurance as a safety net, five apple growers in Vermont and New Hampshire are launching new IPM techniques to reduce apple scab.

Across the nation, a five- to eight-year lag exists between when an IPM technique is developed through research and when growers adopt the new technique on their farms. The "Whole Farm" Apple Scab IPM Project provides the necessary link between small-scale research and industry-wide extension. Participants in this project test IPM methods in a full orchard before the methods are extended to other growers. The Federal Crop Insurance Program plays a crucial role of protecting each acre with crop insurance. The cost to the grower is just a few dollars per acre.

Apple scab is a serious disease caused by a fungus that overwinters on infected fallen leaves. If uncontrolled, scab results in severely blemished fruit that is largely unmarketable. Certain apple varieties are more susceptible than others. McIntosh apples, which constitute 62 percent of the New England apple crop, are particularly vulnerable. If scab does occur and the apples must be sold for processing instead of as a higher priced fresh-market crop, the farmers are insured for the difference between the two prices.

Geoff Demong participates in the apple scab project at Belmont Orchard in Shoreham, Vermont. Photo: L. Berkett.

In the past, growers would begin spraying fungicides in the spring without knowing their orchard's potential for disease. Through this project, the orchard's potential for apple scab is assessed in the fall. If the potential is low, fungicide applications can be delayed in the spring, reducing the total number of applications for that year. Growers can also reduce the potential for disease by cleaning orchards, mowing overwintered leaves, and applying urea to hasten the decomposition of the leaf litter.

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New Hampshire

Mite Makes Right in Apple Orchard

This past May, unusual shipments arrived at the University of New Hampshire: coolers of apple blossom clusters. The clusters contained beneficial mites, known as *Typhlodromus pyri,* feeding on the pollen within. The final destinations for these mites were the orchards of four growers who are participating in a biological control program.

State IPM Coordinator Alan Eaton and New England Fruit Consultant Glen Morin obtained the mites and blossoms from scientists at New York's Agricultural Experiment Station as part of a seven-state collaboration. Growers in the region have agreed to "seed" their orchards with the beneficial *T. pyri,* which feeds on the pestiferous European red mite.

Imported clusters are attached to existing branches with paper clips, twist-ties, even clothespins, at the rate of 50 per tree. If predatory mites (below) can become established in orchards in the Northeast, they will take the place of some miticide spraying, controlling harmful mites that feed on the juices of apple leaves. As registration of miticides decreases and the European red mite develops resistance to remaining miticides, sustainable management is more necessary than ever before.

Participating growers have been educated about how to make their orchards ideal homes for *T. pyri.* For example, they have avoided harsh chemical pesticides that kill predators. Seeding mites has been successful in Massachusetts and New York, and is being tried this year in those states plus Vermont, Maine, Connecticut, and Rhode Island. It could soon be a valuable addition to New Hampshire's Apple IPM Program.

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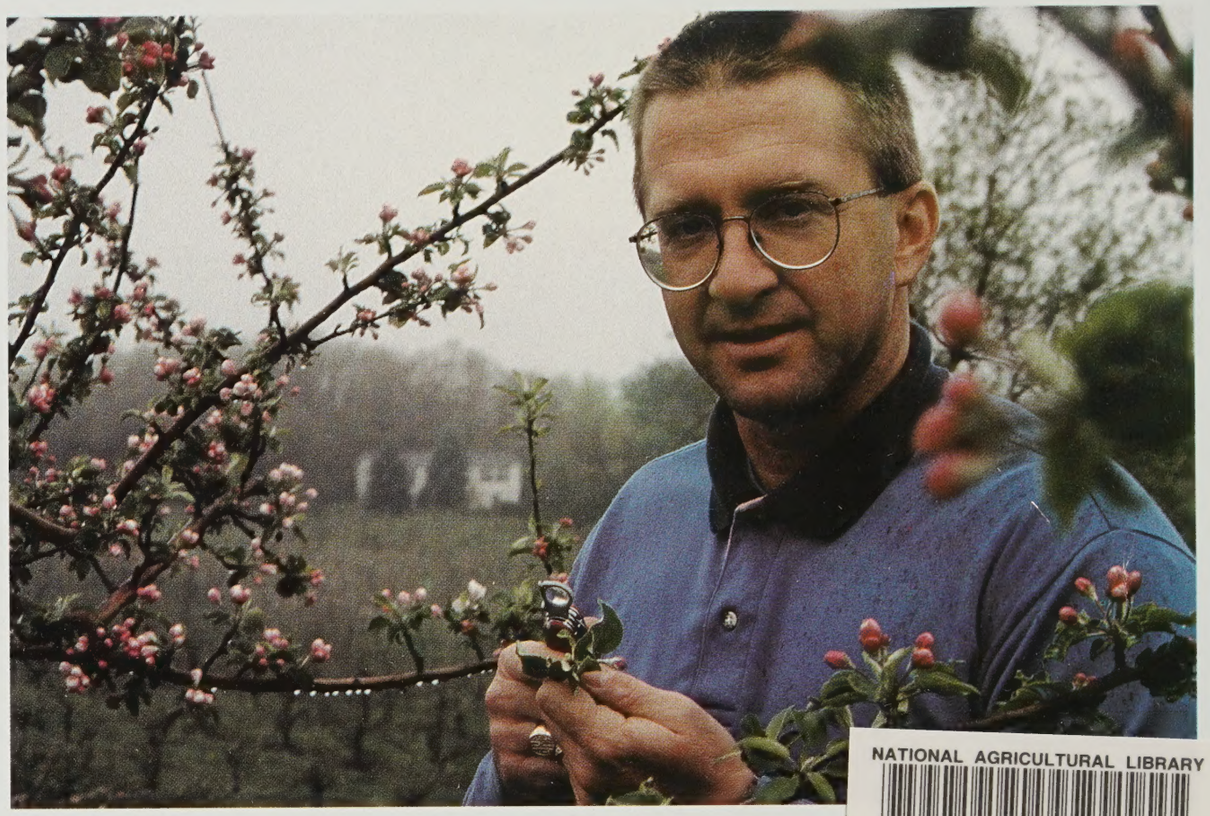
Jonathan Bishop

Connecticut IPM Grower

The most unusual fact about Bishop's Orchards isn't that it has been a family-owned business for 125 years, although that is certainly worthy of mention. In fact, co-owner Jonathan, a 5th generation Bishop, can lay a hand on the apple trees that were planted by his great grandfather in 1928.

What makes the orchards unique is the sight that beholds visitors when they drive to Guilford, a coastal Connecticut town, on an early summer day. The trees are decorated with red plastic fruit, awaiting the first customers—which happen to be flies. Bishop's Orchard is the largest in the country to "trap out" apple maggot flies, a serious pest in the Northeast.



Less Pesticide, More Predators

While most other producers spray a series of insecticides to prevent the fly from laying an egg inside the fruit, Jonathan and his family take a different tack. They coat 1,800 spheres with a mixture of paint, sugar water, and trace quantities of insecticide. (There is never more insecticide on the sphere than is allowed on the finished fruit.) Once they hang these spheres in the orchards, the apple maggot flies are attracted to them, feed, fly off, then die.

One advantage to this labor-intensive method is that pesticide use for the orchard can be measured in ounces instead of pounds, and targeted to the tiny fly that feeds on it. A second advantage is that as insecticide applications are delayed or avoided, populations of beneficial predators can build. These predators control leafminers, mites, and other pests. "Some blocks in the orchard have had no miticides in ten years," says Jonathan. Considering the expense of miticides, the savings are considerable. "I guess we've also reduced our late-season insecticides by 70 to 80 percent," he reports. "We never treat for green aphids and grain aphids."

Renegade Roots

Jonathan's unassuming demeanor hides the IPM renegade he truly is. In 1990 he asked Lorraine Los at the University of Connecticut about trapping out apple maggots. She encouraged him to participate in an experiment that lasted four years and led to collaboration with entomologist Ron Prokopy at the University of Massachusetts. Now Bishop's Orchards is the largest orchard in the Northeast with a trap-out/reduced spray program. The farm consists of 145 acres of apples and 175 acres of pears, peaches, small fruits, U-pick vegetables, fields, and woods.

Jonathan participated for two years in the University of Connecticut's full-season training program during the mid-1980s. This program provides fruit growers with hands-on learning throughout the growing season. "We've always had good access to UConn personnel," says Jonathan. "Working with them gives us confidence to try something new."

Even at the administrative level, Jonathan keeps testing new waters. He recently helped to set research and extension priorities as part of an IPM Initiative planning team. He sees a strong need for disease-resistant plantings and reliable monitoring techniques. He also is convinced that a "conventional" grower no longer exists. "Once you know IPM works," says Jonathan, "you can't go backwards. It's not possible."

Connecticut

No Beating Around the Bush with Nursery IPM

As mist wraps around the rhododendrons at Planters' Choice Nursery, the sixth tractor trailer truck of the day pulls in.

Workers in yellow slickers and boots begin to unload dozens of potted junipers, placing them in the 130-acre nursery. One of the men spots a small dark weevil on the crop and radios the office manager, Barbara, for advice. "Get Tim to look at it," she says. "He's out there scouting the boxwood."

Within a few moments Tim Abbey, coordinator of nursery crops IPM at the University of Connecticut, captures the beast and quietly confirms that it is a black vine weevil. Not good news.

Real-Life IPM

For this nursery in Newtown, Connecticut, arrival of contaminated stock puts to the test their commitment to IPM. Barbara calls the nursery that shipped the product. Tim confers with the on-site nursery propagator, Mary Broadhurst, and the owner, Chuck Newman. Should the load be refused? Destroyed? These are the kinds of choices a nursery faces each day, and the outcome depends on who's steering the ship.

Chuck Newman first met Tim at Connecticut Agriculture Day in Hartford and later asked if Planters' Choice could be a site for Tim's IPM program. "It's been a real success having Tim come here," says Chuck. "People at UConn have always been good to us." Since 1995 Tim has visited weekly to scout for pests and advise on proper treatments, timing, and spot spraying. By following IPM techniques, the nursery has cut insecticide use by 60 percent in one year.

Chuck Newman, owner of Planters' Choice Nursery in Connecticut, believes that IPM is a great move forward for the nation.

"People in Washington have been talking about cutting insecticide use, and here's a way to *do it!*" says Chuck. "If we could cut back and eliminate some of the environmental hazards, it would be a great move forward. We'd have a less toxic America—less air pollution, less water contamination." Chuck's participation in a team-building IPM Initiative meeting likewise reflects his enthusiasm. "I felt really good about the meeting because IPM has a lot of promise," he says, his eyes animated in his broad face.

Planters' Choice stocks about 800 different species of trees, shrubs, and vines, yet Chuck and Tim still consider the nursery small enough for scouting and preventive measures to have a marked effect. "We're able to use less toxic insecticides because we're catching the insects when they're smaller," says Chuck. He estimates that it takes less time to have an IPM program than to have a calendar spray program. Time is invested in inspecting plant material instead of spraying. "IPM makes the public happier, too," he says.

So far their IPM program has focused on insects, but Chuck and Tim see a need to manage diseases with IPM practices. Planters' Choice offers disease-resistant crabapples and lilac hybrids, and the owners are willing to try more. For Tim, that is the reason this IPM nursery is so successful. "There's a willingness to learn and try something else," he says. "To ask questions. To make a difference."

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Front cover: Chuck Newman and plant propagator Mary Broadhurst confer over rhododendron care at Planters' Choice.

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The World Wide Web site for the Northeast Region is http://www.nysaes.cornell.edu/ipmnet/

Credits for uncaptioned photographs: p. 7 (sweet-corn), D. Prostak; p. 7 (lily leaf beetle, lilies), D. Casagrande; p. 8, J. Whalen; all others, C. Koplinka-Loehr. 1.3M AP 8/96.